PROCEEDINGS

OF THE

ROYAL SOCIETY OF EDINBURGH.

VOL. VI. 1866–67. No. 71.

EIGHTY-FOURTH SESSION.

Monday, 26th November 1866.

SIR JAMES COXE, Councillor, in the Chair.

The following Council were elected :—

President.

PRINCIPAL SIR DAVID BREWSTER, K.H., LL.D., D.C.L.

Honorary Vice-President, having filled the Office of President.

HIS GRACE THE DUKE OF ARGYLL.

Vice-Presidents.

Hon. LORD NEAVES.
Principal FORBES.
Professor INNES.
Prof. LYON PLAYFAIR, C.B.
D. MILNE HOME, Esq.
Dr CHRISTISON.

General Secretary—Dr JOHN HUTTON BALFOUR.

Secretaries to the Ordinary Meetings.

Dr GEORGE JAMES ALLMAN.
Professor TAIT.

Treasurer—DAVID SMITH, Esq.

Curator of Library and Museum—Dr DOUGLAS MACLAGAN.

*Councillors.**

JAMES T. GIBSON-CRAIG, Esq.
EDWARD SANG, Esq.
Sir JAMES COXE, M.D.
Rev. Dr BLAIKIE.
Dr A. CRUM BROWN.
Dr BURT.
Professor KELLAND.
Dr MATTHEWS DUNCAN.
WILLIAM TURNER, M.B.
Dr JOHN MUIR.
Rev. THOMAS BROWN.
JAMES SANDERSON, Esq.

Monday, 3d December, 1866.

Sir David Brewster, the President, delivered the following Opening Address:—

Gentlemen,—Of all the agencies which are at work in the material universe, the light of the sun is doubtless the most remarkable, whether we study it in its sanitary, its scientific, or its æsthetical relations In the language of metaphor, it is the very life-blood of nature, without which everything material would fade and perish; the fountain of all our knowledge of the external universe; and the historiographer of the visible creation, recording and transmitting to future ages all that is beautiful and sublime in organic and inorganic nature, and stamping on perennial tablets the hallowed scenes of domestic life, the ever-varying phases of social intercourse and the more exciting scenes of bloodshed and war, which Christians still struggle to reconcile with the obligations of their faith.

The influence of light on physical life is a subject of which we know little; but the science of light, which has been studied for nearly two centuries by the brightest intellects in the civilised world, consists of a body of facts and laws of the most extraordinary kind—rich in knowledge, popular and profound, and affording to educated students simple and lucid explanations of that boundless and brilliant array of phenomena which light creates, and manifests, and developes. While it has given to astronomy and navigation their telescopes and instruments of discovery, and to the botanist, the naturalist, and the physiologist, their microscopes, simple, compound, and polarising,—it has shown to the student of nature how the juices of plants and animals, and the integuments and filaments of organic life, elicit from the pure sunbeam its prismatic elements—clothing fruit and flower with their gorgeous attire, bathing every aspect of nature in the rich hues of spring and autumn, giving to the sky its azure, and to the clouds their gold.

In treating of the influence of light as a sanitary agent, we enter upon a subject almost entirely new; but admitting the existence of the influence itself, as partially established by analogy and observation, and asserting the vast importance of the subject in its social aspects, we venture to say that science furnishes us with principles and methods by which the light of day may be thrown into apartments which a sunbeam has never reached, and where the poisons and the malaria of darkness have been undermining sound constitutions, and carrying thousands prematurely to the grave.

The influence of light upon vegetable life has been long and successfully studied by the chemist and the botanist. The researches of Priestley, Ingenhousz, Sennebier, and Decandolle, and the more recent ones of Carradori, Payen, Macaire, Draper, Gratiolet, Gardner, Daubeny, and Hunt, have placed it beyond a doubt that sunlight exerts the most marked influence upon the respiration, the absorption, and the exhalation of plants, and, consequently, on their general and local nutrition. Draper and Gardner determined the influence of the differently coloured rays in the germination of plants and in the decomposition of carbonic acid, and they found that the yellow rays were particularly active in producing the green colour of the leaves. Mr Hunt has shown that the germination of seeds is more rapid under the influence of the chemical rays than in the dark or even under white light—a result confirmed by the observations, on a large scale, of the Messrs Lawson and Sons. The curious fact of plants bending towards the light, as if to catch its influence, must have been frequently observed. Mr Hunt found that this influence, which is strikingly shown by the potato, is due to the action of the *yellow rays*, and, what is very remarkable, that in *red light* the plant bends from it.

If light, then, is so essential to the life of plants, we may reasonably suppose that it is necessary, though to a less extent, to the development and growth of animals; and many observations have been recently made in confirmation of this important fact. Dr Edwards found that all the eggs of frogs exposed to light were developed in succession, but that none of those kept in the dark were well developed. Employing the tadpoles of the *Rana obstetricans*, he found that the action of light developes the different parts of the body in that just proportion which characterises the adult —the type of the species.

In papers communicated to the Imperial Academy of Sciences, M. Moleschoff of Heidelberg has shown that the quantity of carbonic acid exhaled by frogs (the *Rana esculenta*) is much greater in light that in darkness;* but the most important researches on the subject were communicated to the same Society by M. Beclard in 1858. From a series of experiments, continued for four years in the Laboratory of the Faculty of Medicine, he obtained the following results:—†

1. That the nutrition and development of animals that breathe by the skin experience remarkable modifications under the influence of the differently-coloured rays of the spectrum. The eggs of the fly (*Musca carnaria*), placed in six bell glasses, *violet, blue, red, yellow, transparent*, and *green*, produced worms which, at the end of four or five days, were very differently developed. Those developed in the *violet* glass were triple in size and length to those in the *green* glass, the influence of the other colours diminishing in the above order.

2. That the same weight of frogs produced more than twice the quantity of carbonic acid, in respiration, in the *green* than in the *red* glass. When the same frogs were skinned, the carbonic acid was greater in the *red* than in the *green* rays. No difference was observed with birds, and the small mammalia, such as mice, owing to their being covered with hair and feathers.

3. That the cutaneous exhalation of the vapour of water is *one-half* or *one-third* less in the dark than in ordinary daylight, or in *violet* light, in which the exhalation is the same.

Few and imperfect as these observations are, they entitle us to inquire into the influence of light upon the human frame, physical and mental, in health and disease, in developing the perfect form of the adult, and in preserving it from premature decay. In the absence of researches which might have been made in our hospitals, prisons, and madhouses, we must grope our way among general speculations and insulated facts, and we have no doubt that the direct influence of light over the phenomena of life will not be found limited to the lower races of the animal world.

Man, in his most perfect type, is doubtless to be found in the temperate regions of the globe, where the solar influences of light, heat, and actinism, are so nicely balanced. Under the scorching heat of the tropics, he cannot call into exercise his highest powers. The calorific rays are all-powerful there, and lassitude of body and immaturity of mind are their necessary results; while in the darkness of the polar regions, the distinctive characters of our species almost disappear in the absence of those genial influences which are so powerful in the organic world.

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* *Comptes Rendus*, 1855, tom. lv. pp. 363, 456, 643.

† *Ib.* 1858, tom. xlvi. p. 441.

It is well known to all who seek for health in a southern climate, that an ample share of light is considered necessary for its recovery. In the hotels of France and Italy, the apartments with a south exposure are earnestly sought for, and, under the advice of his physican, the patient strives to fix himself in these bright localities. The salutary effect, however, thus ascribed to light is supposed to arise from the greater warmth of the solar rays; but this can hardly be the case in mild climates, or indeed in any climate where a fixed artificial temperature can be easily maintained. Something, too, is due to the cheering effect of light upon an invalid; but this influence is not excluded from apartments so situated that from a western or even northern window we may enjoy the finest scenery illuminated by the full blaze of a meridian sun.

While our distinguished countryman, Sir James Wylie, late physician to the Emperor of Russia, resided in St Petersburg, he studied the effects of light as a curative agent. In the hospitals of that city there were apartments without light, and upon comparing the number of patients who left these apartments cured, he found that they were only *one-fourth* the number of those who went out cured from properly lighted rooms. In this case the curative agency could not reasonably be ascribed either to the superior warmth or ventilation of the well-lighted rooms, because in all such hospitals the introduction of fresh air is a special object of attention, and the heating of wards without windows is not difficult to accomplish.

But 'though the records of our great hospitals may not assist us in our present inquiry, yet facts sufficiently authentic may be gathered from various quarters. In the years of cholera, when this frightful disease nearly decimated the population of some of the principal cities in the world, it was invariably found that the deaths were more numerous in narrow streets and northern exposures, where the salutary beams of light and actinism had seldom shed their beneficial influence. The resistless epidemic found an easy prey among a people whose physical organisation had not been matured under those benign influences of solar radiation which shed health and happiness over our fertile plains, our open valleys, and those mountain sides and elevated plateaus where man breathes in the brighter regions of the atmosphere.

Could we investigate the history of dungeon life of those noble martyrs whom ecclesiastical or political tyranny have immured in darkness, or of those felons whom law and justice have driven from society, we should find many examples of the terrible effects which have been engendered by the exclusion of those influences which are necessary for the nutrition and development of the lower animals.

Dr Edwards applies to man the principles which he deduced from his experiments on animals; and he maintains that, "in climates in which nudity is not incompatible with health, the exposure of the whole surface of the body to light will be very favourable to the regular conformation of the body." In support of this opinion he quotes a statement by Humboldt, that among the people called Chaymas, who live under the Equator, both men and women are very muscular and have fleshy and rounded forms, and that he had not seen a single individual with a natural deformity." "I can say the same," he adds, "of many thousands of Caribs, Muyscas, and Mexican and Peruvian Indians, whom I have observed during five years. Deformities and deviations are exceedingly rare in certain races of men, especially those which have the skin strongly coloured."

If light thus developes in certain races the perfect type of the adult who has grown under its influence, we can hardly avoid the conclusion drawn by Dr Edwards, "that the want of sufficient light must constitute one of the external causes which produce those deviations in form which are observed in children affected with scrofula,—an opinion supported by the fact that this disease is most prevalent in poor children living in confined and dark streets."

Following out the same principle, Dr Edwards infers, "that when these deformities do not appear incurable, exposure to the sun is one of the means tending to restore a good conformation." "It is true," he adds, "that the light which falls upon our clothes acts only by its heat, but the exposed parts receive the peculiar influence of the light." "Among these parts," he continues, "we must certainly regard the eyes as not merely designed for the perception of colour and form. Their exquisite sensibility to light fits them peculiarly for transmitting it throughout the system, and we know that even a moderate light on the retina produces in several diseases a general exacerbation of symptoms."

If the light of day, then, contributes to the development of the human form, and lends its aid to art and nature in the cure of disease, it becomes a personal and national duty to construct our dwelling-houses, our schools, our workshops, our factories, our churches, our villages, towns, and cities upon such principles and in such styles of architecture as will allow the life-giving element to have the fullest and the freest entrance, and to chase from every crypt, and cell, and corner the elements of uncleanness and corruption which have a vested interest in darkness.

Although we have not visited the prisons and lazarettos of foreign countries, to describe the dungeons and caverns in which the victims of despotism and crime are perishing without light and air, yet we have seen enough in our own country—in private houses, in the most magnificent of our castles, and in the most gorgeous of our palaces—to establish the fact that there is hardly a house in town or country without dark apartments which it is in the power of science to illuminate. In most of the principal cities of Europe, and in many of the finest towns of Italy, where external nature wears her brightest attire, there are streets and lanes in which the houses on one side are so near those on the other, that hundreds of thousands of human beings are neither supplied with light nor air, and carry on their trades in almost total darkness. Providence—more beneficent than man—has provided the means of lighting up to a certain extent the workman's home, by the expanding power of the pupil of his eye, and by an increasing sensibility of his retina; but the very exercise of such powers is painful, and every attempt to see when seeing is an effort, or to read and work with a straining eye and an erring hand, is injurious to the organ of vision, and sooner or later must impair its powers. Thus, deprived of the light of day, thousands are compelled to carry on their trades principally by artificial light—by the consumption of tallow, oil, or gas, thus inhaling from morning till midnight the offensive odours and polluted effluvia which are more or less the products of artificial illumination.

It is in vain to expect that such evils, shortening and rendering miserable the life of man, can be removed by legislation or arbitrary power. In various great cities attempts are making to replace their densely congregated streets and dwellings by structures at once ornamental and salutary; and Europe is now admiring that great renovation in a neighbouring metropolis, by which hundreds of streets and thousands of dwellings, once the seat of poverty and crime, are replaced by architectural combinations the most beautiful, and by hotels and palaces which vie with the finest edifices of Greek or of Roman art.

These great improvements, however, are necessarily local and partial, and centuries must pass away before we can expect those revolutions in our domestic and city architecture under which the masses of the people will find a cheerful and well-lighted home. We must, therefore, attack the evil as it exists, and call upon science to give us such a remedy as she can supply.

There can be no doubt that science does possess such a remedy —a remedy, too, easily understood and easily applied. Like all other remedies, however, it has its limits, but within these limits the principles and methods which science dictates are unquestionable and efficacious.

With rare exceptions, apartments are lighted with vertical windows, which admit the light of the sun, either directly or when reflected from the sky, or from adjacent surfaces. In narrow streets and lanes, the light which enters the window comes chiefly from a portion of the sky, and the value of this portion as an illuminating agent depends on its magnitude or area, and on its varying distance from the sun in his daily path; but whether the area be large or small, bright or obscure, it is the only source of light which the window can command; and the problem which science pretends to solve is to throw into the dark apartment as much light as possible—all the light, indeed, which is visible from the window, excepting that which is necessarily lost in the process.

In lanes or closes shut up at both ends by lofty houses, or by projecting buildings, it is sometimes only from a small portion of the sky towards the zenith that the light can be obtained, and in this case part of it might be advantageously thrown into a window by expensive reflectors; but in streets and lanes open at both ends, where a narrow strip of the sky is visible from one point of the horizon to the opposite point, no aid whatever can be obtained from reflectors, and in such cases the method we are about to describe is peculiarly effective.

If in a very narrow street or lane, we look out of a window with the eye in the same plane as the outer face of the wall in which the window is placed, we shall see the whole of the sky by which the apartment can be illuminated. If we now withdraw the eye inwards, we shall gradually lose sight of the sky till it wholly disappears, which may take place when the eye is only *six* or *eight* inches from its first position. In such a case the apartment is illuminated only by the light reflected from the opposite wall, or the sides of the stones which form the window; because, if the glass of the window is *six* or *eight* inches within the wall, as it generally is, not a ray of light can fall upon it.

If we now remove our window and substitute another in which all the panes of glass are roughly ground on the outside, and flush with the outer wall, the light from the whole of the visible sky and from the remotest parts of the opposite wall, will be introduced into the apartment, reflected from the innumerable faces or facets which the rough grinding of the glass has produced. The whole window will appear as if the sky were beyond it, and from every point of this luminous surface light will radiate into all parts of the room. In order to explain the superior effect of roughly ground glass, let us suppose that the ordinary window is replaced with a single sheet of the best glass inserted flush with the outer wall. The whole of the light from the visible portions of the sky will fall upon its surface, but at such an obliquity that four or five sixths of it will be reflected outwards, and the other two or one sixth, which is transmitted, will fall on the floor or on the shutters, and be of no value.

In aid of this method of distributing light, the opposite sides of the street or lane should be kept white-washed with lime, and for the same reason the ceilings and walls of the apartment should be as white as possible, and all the furniture of the lightest colours.

Having seen such effects produced by imperfect means, we feel as if we had introduced our poor workman or needle-woman from a dungeon into a summer-house, where the aged can read their Bible,—where the inmates can see each other, and carry on their work in facility and comfort. By pushing out the window we have increased by a few cubic feet the quantity of air to be breathed, and we have enabled the housemaid to look into dark corners where there had hitherto nestled all the elements of corruption. To these inmates the winter twilight has been shortened, the sun has risen sooner and set later, and the midnight lamp is no longer lighted when all nature is smiling with the blessed influences of day.

But it is not merely to the poor man's home that these processes are applicable. In all great towns, where neither houses nor palaces can be insulated, there are almost in every edifice dark and gloomy crypts thirsting for light; and in the city of London there are places of business where the light of day never enters, and where the precious light which the sky sends down between chimney tops is allowed to fall useless on the ground. On visiting a friend whose duty confined him to his desk during the official part of the day, we found him with bleared eyes struggling against the feeble light which the opposite wall threw into his window. We counselled him to extend a blind of fine white muslin on the outside of his window and flush with the wall. The experiment was soon made. The light of the sky above was caught by the fibres of the linen, and thrown straight upon his writing table, as if it had been reflected from an equal surface of ground glass. We may mention another case equally illustrative of our process. A party visiting the mausoleum of a Scottish nobleman wished to see the gilded receptacles of the dead which occupied its interior. There was only one small window through which the light entered, but it did not fall upon the objects to be examined. Upon stretching a muslin handkerchief from its four corners, it threw such a quantity of light into the crypt as to display fully its contents.

But while our method of illuminating dark apartments is a great utilitarian agent, it is also an æsthetical power of some value, enabling the architect to give the full effect of his design to the external façade of his building, without exhibiting to the public eye the vulgar arrangements which are required in its interior. Our National Picture Gallery on the Mound, from the beautiful designs of Mr Playfair, is lighted from above; but there are certain small apartments on the west side of it which cannot be thus lighted, and these being very useful, the architect was obliged to light them by little windows in the western façade. These windows are dark and unseemly gashes in the wall, about two feet high and one foot broad; and being unfortunately placed near the fine Ionic portico,—the principal feature in the building,—they greatly interfere with the symmetry and beauty of the western façade. Had there been no science in Edinburgh to give counsel on this occasion, the architect should have left his little apartments under the patronage of gas or oil; but science had a complete remedy for the evil, and in the hope that it may yet be applied, we offer it to those who have the charge of this noble building. Take sheets of thick plate glass the exact size of the present windows, and of such a colour, that when one side is roughly ground it will have the same colour as the freestone. When the openings are filled with these plates, having the ground side outwards, the dark gashes will disappear, the apartments will be better lighted, and the building will assume its true architectural character. The plates of glass thus inserted among the stones may, when viewed at a short distance, show their true outline, but this could not have happened if, during the building of the wall, some of the stones had been left out and replaced by plates of glass of the same size. This method of illumination will enable architects to light the interior of their buildings by invisible windows, and thus give to its exterior façade the full æsthetical effect of their design.

If it is important to obtain a proper illumination of our apartments when the sun is above the horizon, it is not less so when he has left us to a short-lived twilight, or consigned us to the tender mercies of the moon. In the one case it is chiefly in ill-constructed dwelling-houses, and in large towns and cities, where a dense population, crowded into a limited area, occupy streets and lanes in almost total darkness, that science is called upon for her aid; but in the other, we demand from her the best system of artificial illumination, under which we must spend nearly one-third of our lives, whether they are passed in the cottage or in the palace, in the open village, or the crowded city.

When we pass from the flickering flame of a wood fire to rods of pine wood charged with turpentine—from the cylinder of tallow to the vase filled with oil—from wax lights to the flame of gas, and from the latter to the electric light,—we see the vast and rapid stride which art and science have taken in the illumination of our houses and streets. We have now obtained sufficient sources of light; we require only to use it safely, economically, and salubriously. The method which we mean not only to recommend, but to press upon the public attention, unites the three qualities which are essential in house illumination; but till our legislators and architects, and the leaders of public opinion, shall be more alive to the importance of scientific truths, in their practical phase, we can have no hope of its general adoption. True knowledge, however, advances with time. Vulgar prejudices are gradually worn down, and in less than a century, whether we have the electric light or not, we shall have our artificial suns shedding their beneficial rays under the guidance of science.

The present method of lighting our houses by burning the lights within its apartments, is attended with many evils. The intolerable increase of temperature in well lighted rooms, whether they are occupied with small or large parties—the rapid consumption of the oxygen which our respiratory system requires to be undiminished—the offensive smell of the unconsumed gas—the stench of the oleaginous products of combustion—the damage done to gilded furniture and picture frames,—the positive injury inflicted upon the eye by the action of a number of scattered lights upon the retina,—and the risks of fire and explosion,—are strong objections to the system of internal illumination. About half a century ago I proposed to illuminate our houses by burning the gas externally, or placing it within the walls of the house, or in any other way by which the products of combustion should not vitiate the air of the apartment. The plan was received with a smile. It had not even the honour of being ridiculed. It was too Quixotic to endanger existing interests, or tread upon vested rights. Owing to the extended use of gas, however, its evils became more generally felt, especially when large assemblages of persons were for many hours exposed to them; but no attempt was made to alter the existing system till 1839, when a Committee of the House of Commons was appointed to inquire into the best method of lighting the house. Many eminent individuals were examined; and in consequence of the report of the Committee, the new system was adopted of lighting from without, or, in which the air breathed by the members is entirely separated from the air which supplies the burners. A similar change has been made in lighting many other public halls; but the new system, in its most general aspect, has been carried out in one of the principal apartments in Buckingham Palace, where the light radiates from the roof, as if from the sky above, without any of the sources of light being visible. This method, of course, can be adopted only in halls, or apartments with an external roof. In all other cases difficulties must be encountered in houses already built; but we have no doubt that the ingenuity of the engineer and architect will overcome them, whether the method is to be accommodated to old buildings, or applied in its most perfect state to houses erected on purpose to receive it. But, however great may be these difficulties, it is fortunate that, whether we are to have the advantage of the electric light, or of a purer form of carburetted hydrogen gas, the mode of distributing it will be, generally speaking, the same, and we therefore need not hesitate to introduce the new method on the ground that it may be superseded by another.

Having so recently escaped from the inhumanity of a tax which prohibited the light and air of heaven from entering our dwellings, we trust that the governments of Europe will freely throw these precious influences into the dark abodes of their overcrowded cities, and that wealthy and philanthropic individuals will promote the same object in more limited spheres, and set the example of lighting, heating, and ventilating, according to the principles of science. Dr Arnott has already taught us how to heat our apartments with coal fires, without breathing either the gases or the dust which they diffuse. Why should we delay to light them also without breathing a noxious gas, and overlaying the organs of respiration with the nameless poisons generated in the combustion of the animal and vegetable substances employed in the furnishing of our apartments.

I cannot conclude these observations without referring to the use which may be made of them in our own city, notorious for the number of its dark and narrow lanes, and for the thousands of unlighted and unventilated dwellings which they contain. The devoted men who venture daily into these abodes of malaria and uncleanness, can alone describe to us the cimmerian darkness and the tainted atmosphere in which their pallid occupants live, and move, and have their being. They alone can paint the harrowing scenes which disease and destitution present to them in these joyless homes. To what extent evils like these can be remedied it is a sacred duty to inquire. To what extent they will be remedied by the large and expensive sanitary measures now contemplated, we do not venture to predict; but it is very obvious, that the upper and lower ends of the offensive lanes, which are to be intersected by the new streets, can derive little benefit from them in respect of ventilation, and none whatever in giving additional light to the houses which remain.

The only effectual mode of ventilating and lighting a dark and crowded apartment is, to strike out a large opening in the wall for the fresh admission of air, and to construct the window which is to close it so as to give the most copious entrance to the light of the sky. A process so cheap, so easily executed, and so obviously effectual, ought to be the very first step in any measure of sanitary reform; and it is clearly one which, if not effected by the philanthropy of the public, ought to be enjoined by Act of Parliament upon the house proprietors individually, or upon the citizens at large.

In giving expression to these opinions I did not expect to have them instantly, and in every point, confirmed by one of those devoted men to whom I have referred as the visitors of the dwellings of the poor. "The closer," says this anonymous philanthropist, in an article published within these few days,* "we look into the state of the homes of the poor in this city, the greater seems the extent of misery and degradation to be grappled with, and the more are we convinced that any sanitary scheme which does not contemplate the internal improvement of the dwelling-houses as one of its chief objects, will never go to the root of the evil. The opening of new streets will not alone be sufficient; the houses that remain must be so altered that they will admit light and fresh air, which, in many cases, are at present almost entirely excluded. We have visited dwellings in the Grassmarket and West Port, situated in airy localities, but which, by simply being out of repair and not having sufficient ventilation, are really uninhabitable. We cannot insist too strongly on the absolute necessity there is for the authorities directing their attention to this point. Where proprietors receive a sufficient return, they must be compelled to do their duty in this respect; and in cases where they can on good ground plead inability, the work must be done for them. The labour is so formidable that it will task the whole energies of the civic authorities, and yet leave much to be done by private benevolence."

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* "Edinburgh Evening Courant," Nov. 21, 1866.

In proceeding to give you a brief notice of the Fellows of the Society who have died during the present year, I regret to say that their number is greater than usual, and that we have to lament the loss of some of our most distinguished members.

David Craigie, an eminent Physician, was born in Leith on the 6th June 1793. He entered the University of Edinburgh in 1809, where he was distinguished by his classical acquirements and by his successful study of several of the Eastern languages, especially Hebrew and Persian. In 1816 he took the degree of M.D. in the University—the subject of his thesis being *De Vita Animali.* In 1818 he became a Member, and in 1819 one of the Presidents of the Royal Medical Society. Soon after this he gave two courses of lectures on Anatomy. Between 1820 and 1827 he assisted Dr Andrew Duncan in the editorship of the "The Edinburgh Medical and Surgical Journal," which Dr Duncan had founded in 1805. In 1827 Dr Christison joined Dr Craigie in editing this important journal, and this joint editorship continued till 1832, when Dr Christison was appointed to the Chair of Materia Medica, and from that time till 1855 Dr Craigie was its sole proprietor and editor. In 1832 Dr Craigie was elected a Fellow of the Royal College of Physicians, and in the following year a Fellow of the Royal Society, to whose Transactions he does not seem to have contributed. In 1833 he succeeded Dr James Gregory as physician to the Royal Infirmary; and while he lectured on Practical Medicine, he gave a course of Clinical Medicine, and published for several years Clinical Reports, which contain much valuable information.

For a number of years from 1846 Dr Craigie was prevented by ill health from carrying on the active duties of his profession, but he had so far recovered in 1858 that he was appointed one of the Examiners of the College of Physicians, a duty which on several occasions he performed for the University of St Andrews, who gave Degrees to candidates who had not studied at the United College.

In December 1861 he was elected President of the Royal College of Physicians, and he was able to preside at the dinner given on the 12th October 1863 to the Social Science Congress, at which Prince Alfred, Lord Brougham, and other eminent individuals were present. His health now began to give way; but though he regained it after a journey to Devonshire, symptoms of a serious disease appeared, and he died on the 17th May 1866, when he had nearly completed his seventy-third year.

Dr Craigie's principal works are his "Elements of General and Pathological Anatomy," and his "Elements of the Practice of Medicine," both of which have been much esteemed by the medical profession. The first of these was published in 1828, and was republished in 1848 in a second and enlarged edition. The second appeared in 1836, and displayed great erudition and professional knowledge, but owing to the high price at which it was published it had a comparatively limited circulation.

Sir **John Hepburn Stuart Forbes** was born at Dean House, Edinburgh, on the 25th September 1804. He was the second son of Sir William Forbes, who was a Fellow of this Society from 1804 till his death, and who was frequently a Member of Council. Sir William was an early friend of Sir Walter Scott, who in the fourth canto of Marmion, inscribed to his brother-in-law, Mr Skene, thus justly describes him :—

> And thou and I and dear loved R—(Rae),
> And one whose name I may not say,
> For not Mimosa's tender tree
> Shrinks sooner from the touch than he.

Sir William, the grandfather of Sir John, and the author of the life of Dr Beattie (who became in 1783 an original Member of the Royal Society), was in the same poem thus truly characterised :—

Scarce had lamented Forbes paid
The tribute to his Minstrel's* shade;
The tale of friendship scarce was told
Ere the narrator's heart was cold;
Far may we search before we find
A heart so manly and so kind.

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If mortal charity dare claim
The Almighty's attributed name,
Inscribe above his mouldering clay—
" The widow's shield, the orphan's stay."†

After a complete course of study at the University of Edinburgh, Sir John passed as Advocate in 1826, and he would have pursued the profession of the law, but for the death of his elder brother in 1826, and of his father in 1828, when he succeeded to the baronetcy. In 1833 he was elected a Member of this Society, and in 1834 he married Lady Harriet Kerr, the third daughter of the sixth Marquis of Lothian. Soon after this event he left Edinburgh, where his father and grandfather had resided, and lived almost wholly at Fettercairn House, where he occupied himself nearly exclusively in the management of his estates, and in the discharge of those numerous duties of patriotism and charity, which are so cheerfully and nobly performed by our Scottish landholders. Sir John was for many years an active member of the Highland and Agricultural Society of Scotland, and, for some time acted as its Treasurer. He was particularly interested in the advancement of agriculture as a science as well as an art, and he exerted himself in vain against the miserable parsimony of the Government to obtain a better endowment for the Agricultural Chair in our University.

In 1857 Sir John was appointed Convener of Kincardineshire, the duties of which he discharged with exemplary diligence, devoting himself to the business of the county with a zeal and self-sacrifice which the public did not fail to appreciate. At all hours and in all weathers he was found at his post, even while labouring under attacks of what proved to be a mortal disease.

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* Dr Beattie's principal poem.

† In a note upon this passage Sir Walter says:—" Sir William Forbes of Pitsligo, Bart., unequalled perhaps in the individual affection entertained for him by his friends, as well as in the general respect and esteem of Scotland at large." See *Marmion*, canto iv. note ii.

Sir John acquired at the University of Edinburgh a taste for scientific pursuits. He was particularly attached to geology and meteorology, and he was one of the founders of the Meteorological Society of Scotland, which under his vice-presidency and the presidency of the Marquis of Tweeddale was doing valuable work for that important branch of scientific research.

After an illness of some months' duration, Sir John died in London on the 28th May 1866, in the sixty-second year of his age, and was succeeded in the baronetcy by his nephew, Mr William Forbes. He left an only daughter, who was married in 1858 to the Hon. C. B. Trefusis, M.P., now Lord Clinton.

The Rev. **James Macfarlane** was the son of the Rev. John Macfarlane, Bridgton, Glasgow, and was born at Waterbeck, Dumfriesshire, on the 27th April 1808. After receiving his elementary education at the High School of Glasgow, he entered the University there, and distinguished himself both as a classical scholar and as a student of Divinity. While at College he obtained the degree of Master of Arts, and subsequently that of Doctor of Divinity, and in 1865 he was appointed Moderator of the General Assembly of the Church of Scotland. He was licensed by the Presbytery of Glasgow in 1830, and ordained in 1831 as pastor of the East Church in Stirling. In 1832 he was translated to St Bernard's Church in Edinburgh, and in 1840 he was presented to the living of Duddingston, where he continued to discharge his duties as a parish minister faithfully and efficiently till his death, which took place on the 6th of February 1866, in the 58th year of his age.

James Duncan, M.D., an eminent physician, was born at Perth on the 2d November 1810, and was the only son of Mr Duncan, of the well-known firm of Duncan, Flockhart, and Co. After receiving his early education at Perth, and at the High School of Edinburgh, he entered the University, and took the degree of M.D. in 1834. In the same year, he became a Fellow of the Royal College of Surgeons in London, and in 1835 a Fellow of the Royal College of Surgeons in Edinburgh. He spent about two years on the Continent, and prosecuted the study of anatomy and surgery at the medical schools of France, Germany, Austria, and Italy. On his return to Scotland, he acted as house-surgeon to our eminent countryman Mr Liston, in the Infirmary of Edinburgh, and in the hospital of University College, London. In 1837 Dr Duncan settled in Edinburgh as a medical practitioner, where he rose to great eminence, and enjoyed the largest general practice. He was surgeon to the Royal Infirmary for many years, and in that capacity delivered lectures on clinical surgery. He was elected a Fellow of this Society in 1858; but though he was the author of many valuable papers in the medical journals, he did not contribute to our Transactions.

Dr Duncan was in the habit of spending a few weeks in the country every autumn, as a relaxation from the duties of his extensive practice. In July 1866 he went to the Continent with his wife and family, committing to his son the charge of his patients in Edinburgh. During a few days' residence in Paris, when the cholera prevailed, he seems to have imbibed the germs of that fatal disease. On the 12th of August he was attacked with diarrhœa, which so completely yielded to its usual treatment that he went next day to Orleans. From Orleans he went to Tours, where, on the 15th, he was attacked with cholera, which proved fatal on the 16th August, in the 56th year of his age.

John Cay, of North Charlton, in the county of Northumberland, was born in Edinburgh on the 31st August 1790, and was the eldest son of Mr Robert Hodshon Kay, of North Charlton, Judge Admiral of Scotland. He was educated at the High School and University of Edinburgh, and was admitted into the Faculty of Advocates in 1812. In 1822 he was appointed Sheriff of the county of Linlithgow, an office which he held for forty-three years, and the duties of which, as a sound lawyer and a judicious judge, he discharged with great credit to himself and great satisfaction to the public. Mr Cay took a great interest in the literary and scientific institutions of Edinburgh. He was elected a Fellow of the Royal Society in 1821, and contributed to its Transactions a short notice of a bronze spear-head found on his property in Northumberland. He was also a Member of the Royal Scottish Society of Arts, and was one of the annual Presidents of that important institution. Mr Cay was the author of a work on "The Reform Act," and of two small pamphlets—one an "Analysis of the

Burgh Begistration Act," and the other entitled, "Outlines of the Procedure at Elections for Members of Parliament." When Mr Cay was residing at Burntisland in August 1865, he accidentally fell, and received a severe fracture of the thigh-bone. His naturally robust constitution at first gave hopes of his recovery; but these hopes were disappointed, and after much suffering, born with great Christian resignation and patience, he died in December 1865, in the 75th year of his age.

John Archibald Campbell, Clerk to the Signet, and Sheriff-Clerk of Mid-Lothian, was born in the year 1788, and was the son of John Campbell, Esq. of The Citadel, Leith. In 1813, he was admitted into the Society of Writers to the Signet. From that year to 1816, he was joint Crown Agent; and from 1843 to 1859, when he retired into private life, he was Sheriff-Clerk of Mid-Lothian. Mr Campbell was the founder or joint-founder of some of the most thriving institutions in Edinburgh, and he took an active part in those municipal changes in which the public were so deeply interested.

Mr Campbell took a great interest in archæological researches. He was a Member of the Antiquarian Society, and of the Royal Society of Arts, and he was elected a Fellow of this Society in 1837. He died in Edinburgh on the 7th September 1866, in the 78th year of his age.

James Ivory, one of the Lords of Session, was born at Dundee on the 29th February 1792, and was the son of an engraver of great mechanical skill, and superior literary attainments. He was educated at the Dundee Academy, and acquired there a taste for mathematics, which he afterwards cultivated, and found an agreeable relaxation during the rest of his life. His devotion to mathematics was no doubt encouraged by his uncle, James Ivory, K.H., who was one of the most eminent of our Scottish mathematicians. Mr Ivory was educated at the University of Edinburgh, where he was distinguished by his literary as well as his mathematical acquirements. In 1816 he was called to the Scottish Bar, where he soon rose to great eminence in his profession. In 1830, Lord Jeffrey appointed him one of his depute-advocates, and in 1832 he was appointed Sheriff of Caithness. In the following year he was transferred to the Sheriffdom of Bute, and in 1839, he was appointed Solicitor-General for Scotland. In the following year he was appointed one of the Lords of Session, and in 1849 one of the Judges in the Court of Justiciary. In the same year he was elected a Fellow of this Society. In these various legal offices which Lord Ivory filled his judgments were distinguished by their great soundness, as well as by the elegant diction in which they were expressed.

Before he was called to the Bar, Lord Ivory published a treatise on the Form of Process, and in 1827, the first volume of his edition of Erskine's Institutes, the second volume of which appeared some years afterwards. In consequence of ill health, Lord Ivory resigned his seat on the bench in 1862. Since that time, his health gradually declined, and he was carried off by a stroke of paralysis on the 17th October 1866, in the 74th year of his age.

Lord Ivory was married, in 1817, to the daughter of Mr Lawrie, Deputy-Gazette Writer for Scotland. His eldest son, Mr Thomas Ivory, is counsel to the Commissioners of Woods and Forests; and his third son, Mr William Ivory, Sheriff of Inverness-shire.

John Frederick Louis Hausmann, a distinguished geologist and mineralogist, was born at Hanover on the 22d February 1782. After completing his studies at Brunswick and Gottingen, he was appointed in 1803 to a situation in the administration of the Mines at Brunswick, and in 1805 he made a geological tour through Norway and Sweden. In 1809 he was appointed by the government Inspector General of the Mines and Saltworks of Westphalia, but he soon resigned this office in order to devote himself to the study of Mineralogy. In 1811 he was appointed Professor of Mineralogy and Geology in the University of Gottingen, and while he filled this important chair, he devoted himself to the examination of the Harz Mountains, and made many geological excursions in Sweden, Holland, France, Spain, and England. He was councillor of state in Hanover, an active member of the Royal Society of Gottingen, and a Corresponding Member of the Academy of Sciences, in the Imperial Institute of France.

Professor Hausmann was the author of various Articles and

Memoirs in the German Journals, and in the Transactions of the Royal Society of Gottingen, and of several separate works on Chemistry, Geology, and the Mines of Germany; but his chief productions are his "Travels in various parts of Scandinavia," published in five volumes between 1811 and 1818, and his "Manual of Mineralogy," published in 1813, and reprinted in 1828 and 1847.

Henry Darwin Rogers, LL.D., F.R.S., and F.G.S., a distinguished American Geologist, Professor of Geology in the University of Glasgow, and one of the Foreign Members of this Society, was born in Philadelphia on the 1st of August 1808, and was the third of four brothers, all of whom have been devoted to the cultivation and teaching of Physical Science, their father Dr Patrick Kerr Rogers, having himself been Professor of Natural Philosophy and Chemistry in the College of "William and Mary" in Virginia. At the early age of twenty-two he was elected Professor of Natural History and Physics in Dickinson College, Carlisle, but being desirous of improvement, he resigned his chair, and spent above a year in England, where he studied Analytical Chemistry in the laboratory of Dr Edward Turner, and had the privilege of accompanying Sir Henry De la Beche in his geological excursions.

On his return to Philadelphia he was appointed to the chair of Geology in the University of that city, and while discharging its duties, which he did for many years, he carried on many important scientific researches. Along with Professor A. D. Bache, he made an extensive series of Experiments on the Ashes of Coal, and in conjunction with his brother W. B. Rogers, he made experiments on "The Laws of the Elementary Voltaic Battery."

The first fruits of his geological labours was his Report of the Survey of the state of New Jersey, which he published in 1835 with a large geological map. While engaged in that survey he was employed by the legislature to make a survey of the great state of Pennsylvania, and to this herculean task he devoted many years of his life. It commenced in 1836, and with the aid of a staff of able coadjutors, it was completed in 1855, and published in three volumes, under the title of "The Geology of Pennsylvania, a Government Survey, with a General Survey of the Geology of the United States, Essay on the Coal

Formation and its Fossils, and a description of the Coal Fields of North America and Great Britain." This great work, which was printed and published in Edinburgh, appeared in 1858, and is illustrated with an immense number of maps, geological sections, sketches of scenery, and fossils, executed by Messrs W. and A. K. Johnston.*

It was during the progress of this great survey that Professor Rogers and his brother already mentioned, who was in charge of the survey of the state of Virginia produced their remarkable Memoir "On the Physical structure of the Appalachian Chain, as exemplifying the laws which have regulated the Elevation of Mountain Chains, &c." This Memoir excited a deep interest when read at the meeting of the association of geologists and naturalists which was held at Boston in 1842, and it has been published in its memoirs for that year. Professor Rogers was one of the founders of the association which was expanded into the Association for the Advancement of Science.

After having given to the world the results of his geological researches, he took up his residence at Boston, devoting himself to his favourite studies, and occasionally delivering courses of lectures in the Lowell Institute, which he did with a readiness and felicity of diction rarely exhibited by the cultivators of physical science.

While in Edinburgh, engaged in the publication of his great work, a vacancy took place in the Regius Professorship of Natural History in the University of Glasgow, and through the influence, we believe, of the Duke of Argyll, he was appointed to that chair in 1857. The lectures which he delivered in this new position were greatly admired, and he might have looked forward to many years of rest from the toils of his early life; but in the severe exposures which he endured in his geological surveys, his constitution was so enfeebled, and in the composition and superintendence of his great work he had so overworked his mind, that his colleagues observed for two or three years a gradual failure of health, which terminated fatally at Glasgow on the 29th of May 1866, in the 58th year of his age.

Alan Stevenson, an eminent engineer, was born in Edinburgh, in 1807, and was the eldest son of Mr Robert Stevenson, engineer to the Scottish Lighthouse Board. He was educated at the High School and University of Edinburgh, where he obtained the Felloes' Prize as an advanced student of Natural Philosophy. In 1826 he took the degree of M.A., and in 1840 the University of Glasgow conferred on him the degree of LL.B.

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* About the same time Professor Rogers published an elaborate paper "On the Origin of the Appalachian Coal Strata, Bituminous and Anthracite."

Although he had himself desired to study for the Church, yet he was afterwards led to adopt the profession of a civil engineer, for which he was so highly qualified by his previous education. For many years he was Clerk of Works to the Scottish Lighthouse Board, and on the death of his father in 1842 he succeeded him as their engineer in chief.

During the comparatively short time that his health enabled him to discharge its duties, he erected several Lighthouses on the Scottish coast, the most important of which is that at Skerryvore, a magnificent work, which is not surpassed by any similar structure in the world. It was began in 1838, and completed in 1844. The Eddystone Lighthouse, by the celebrated Smeaton, and that on the Bell Rock, by Mr Robert Stevenson, lose their grandeur when placed in comparison with the gigantic tower at Skerryvore. An interesting account of this great work was published by Mr Stevenson in 1848, under the title of "Account of the Skerryvore Lighthouse, with notes on the Illumination of Lighthouses."

In 1850 he published a very valuable work, entitled "A Rudimentary Treatise on the History, Construction, and Illumination of Lighthouses."

To his great accomplishments as a civil engineer, Mr Stevenson added classical acquirements of no ordinary kind. He had mastered the languages of Greece and Rome, and acquired a critical knowledge of Italian and Spanish.

In 1852, when a severe nervous affection had unfitted him for the duties of his office, he beguiled his hours of suffering by translating into English verse the ten hymns of Synesius, Bishop of Cyrene. These translations, with some pieces of his own, were printed in the present year for private circulation, and have been much admired.

Mr Stevenson was elected a Fellow of this Society in 1838. He was a Member of the Institution of Civil Engineers, and he had the honour of receiving complimentary medals from the

Emperor of Russia, and from the Kings of Prussia and Holland, as acknowledged merits as a lighthouse engineer. When his health prevented him from attending the meetings of this Society, he gave in his resignation, but the Council declined to accept it, and continued to him all the privileges of a Fellow.

The long illness of Mr Stevenson, produced no doubt by the severity of his exposures at Skerryvore, and the responsibilities and anxieties attaching to so great and difficult a work, was borne with exemplary patience and resignation, and he died at Portobello, as a Christian should die, on the 23d December 1865, in the 58th year of his age.

Robert Kaye Greville, a distinguished botanist, was born at Bishop Auckland, on the 13th December 1794, and was the son of the Rev. Robert Greville, Rector of Wyaston in Derbyshire. While he was receiving his education under his father's roof, he spent his leisure hours in the study of plants; and so rapid was his progress, that before he was nineteen he had made careful coloured drawings of between one and two hundred native plants. Being intended for the medical profession, he went through the usual curriculum of four years in London and Edinburgh; but circumstances having rendered him independent, he resolved to devote himself to his favourite study.

In 1816 he married a daughter of Sir John Eden, Bart. of Windleston, and in the same year he came to Edinburgh, where he studied human and comparative anatomy under Dr Barclay.

In 1816 he joined the Wernerian Society, to which he communicated a series of papers on Algæ, which are published in the Transactions of the Society. In 1823 he published the first volume of his great work, entitled "Scottish Cryptogamic Flora," which he completed in six volumes, in 1828. His "Flora Edinensis," containing a description of the plants in the neighbourhood of Edinburgh, appeared in 1828; and in 1830 his "Algæ Britannicæ," a description of the marine and other inarticulated plants in the British Islands, belonging to the Order Algæ. In conjunction with Dr Hooker he published the "Icones Filicum," a splendid work, containing drawings and descriptions of ferns, either very rare or which had been incorrectly figured.

After he had completed these great works, Dr Greville made a special study of the Diatomaceæ, of which he formed a most valuable collection, all the specimens being put upon slides and finely labelled. He wrote upwards of twelve papers descriptive of these minute organisms. For these papers, and also for his contributions to Cryptogamic Botany, the Council of this Society awarded to him, in 1862, the medal founded by his friend, Dr Patrick Neill.

In the brief space to which these biographical notices are necessarily limited, it would be impossible to enumerate even the large number of important papers which Dr Greville published in the Wernerian Transactions, and in the various scientific periodicals of the day, and to give an intelligible account of the important facts which they contain. We must notice, however, his collections of natural history, which are extremely valuable, and not less important to science than the works in which they are described.

His fine collection of Phanerogamic plants, and of Ferns, Mosses, Fungi, and Algæ, increased by subsequent purchases, and consisting of about 50,000 species, constitutes our University Herbarium in the Botanic Garden. His collection of Insects, purchased also by the University, is now deposited in the Museum of Science and Art. His great collection of Diatoms has been purchased by the British Museum; and his collection of land and fresh water Mollusca has been purchased for the Museum of Science and Art in Edinburgh.

The value of Dr Greville's works has been greatly enhanced by the beauty and accuracy of his drawings. His pencil was that of an accomplished artist; and at one time he took up landscape painting as a profession, and contributed several paintings to the Exhibitions of the Scottish Academy.

The works of Dr Greville were as highly appreciated in foreign countries as they were in his own. In 1821 he was elected a Fellow of this Society. In 1825 he was chosen a Member of the Royal Irish Academy, and in 1826 the University of Glasgow conferred upon him the degree of Doctor of Laws. He was also a Fellow of the Linnean Society, and either a corresponding or an honorary member of a great number of Natural History Societies in Europe and America.

In his latter years Dr Greville lived happily at his beautiful villa of Ormelie, near Edinburgh, where, with some exceptions, his health was generally good. Towards the end of last May, however, he imprudently fell asleep on the damp grass, and brought upon himself an attack of inflammation of the lungs, which, in the course of a week, terminated fatally on the 4th of June 1866, in the 72d year of his age.

Dr Greville was a man of rare accomplishments, and of no ordinary virtues. His studies were not confined to science, nor his ambition limited to the honours which it merits, and the fame which it brings. His large heart embraced every measure of philanthropy, whether national or local,—whether originating in vicious legislation, in the necessary inequalities of social life, or bearing upon the victims of ignorance, intemperance, and crime. Nor did he take a less interest in those higher questions which disquiet the inner and nobler life of man, stretching beyond that bourne from which no traveller returns, and affecting interests which time cannot measure nor space define. He had pondered in the lesser world over mysteries which he failed to comprehend,—over marvels of life which startled science and rebuked reason; and he submitted with the same reverence to those deeper mysteries which human instruments had equally revealed. Faith, and science falsely so called, had to him, and has, I hope, to many of us, two opposite horizons—the one where the sun rises, and the other where he sets. In the auroral and meridian light of the one he studied, and lived, and died; and in the murky twilight and midnight darkness of the other, he wept over the fallen stars of science,—the Sappers and Miners of our Faith.

Charles Maclaren, an eminent geologist, was born in Ormiston, East Lothian, on the 7th October 1782, and was the only son of his father, who was a small farmer. His uncle by the mother's side was a smith in the household of George III., and his nephew would have been brought up to the same profession, had it not proved incompatible with the delicacy of his constitution. After acquiring a good education at different parochial schools, and acquiring at home a knowledge of modern languages and of some branches of science, he spent some years as clerk and book-keeper to several Edinburgh firms.

In the year 1816 Mr Maclaren, in conjunction with Mr William Ritchie, established the *Scotsman*, a newspaper which, though persecuted in its early life, has acquired a greater popularity, and reached a higher circulation than any of our Scottish journals. The first number was published on the 25th January 1817, and, speaking generally, Mr Maclaren had the honour of being its Editor till the year 1847, when he resigned it into the hands of its present able conductor. Thus freed from the labours and anxieties of a public journalist, Mr Maclaren was able to devote his whole time to his favourite studies. He made numerous geological excursions to different parts of Scotland, acquiring that accurate knowledge of the science which he displayed in his later works.

Having taken a great interest in the speculations respecting the Plain of Troy as described in the Iliad, he published in 1822 a dissertation on its topography; and in 1847 he visited the locality itself, and acquired that thorough knowledge of the subject, which he communicated to the public in 1863, under the title of "The Plain of Troy Described, and the identity of the Ilium of Homer, with the new Ilium of Strabo proved, by comparing the poet's narrative with its present Topography." The views contained in this able and interesting work have been fully adopted by the most distinguished scholars in this country and on the continent.

Among his numerous geological writings which have appeared in the *Scotsman* and in other journals, the most important is his "Geology of Fife and the Lothians," which appeared in 1839. It contains a description of the wide valley stretching from the Ochils on the North to the Lammermuirs on the South, and fully established Mr Maclaren's reputation as a geologist.*

Among the more prominent points in Mr Maclaren's character, was his remarkable sagacity, and his faith in the power and progress of science, a quality not often possessed by its cultivators. His sagacity was strikingly displayed in predicting the great destiny of the American Republic, a sentiment which he drew from his knowledge of the politics and statistics of that great and prosperous nation. The article on America, in the "Encyclopædia Britannica," was from his pen, and also the article on Troy, in which he describes the interesting results to which we have already referred.

His sagacity was no less displayed, and his faith in science too, when, so early as 1824, he predicted the great success of railway travelling, and spoke of locomotion at the rate of twenty-four miles an hour, or quicker than a race-horse, as a very probable event. Science, however, has outstripped the tardy estimate of our author, and the still tardier one of George Stephenson. A flight of sixty miles an hour with a cargo heavier then a ship of war, which many of us have made, would have shaken the nerves even of these sanguine speculators. When we learn that a distinguished man of science announced in the "Edinburgh Review" the impossibility of navigating the Atlantic by steam, we need not wonder at the slow-coach convictions of the uneducated world.

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* A recent edition, with corrections and additions by the Author, has just been published.

Mr Maclaren was elected a Fellow of this Society in 1837, and of the Geological Society of London in 1846. He was an active member of the British Association, and for the two last years he was President of the Geological Society of Edinburgh.

After resigning the editorship of the *Scotsman*, he retired to his villa of Moreland Cottage, near Edinburgh, where he spent the rest of his life. His health was generally good, and his mental powers unimpared, when on the morning of the 27th August he experienced a stroke of paralysis, which carried him off without suffering on the 10th of September 1866, in the 84th year of his age.

William Whewell, D.D., F.R.S., a distinguished writer on almost every branch of science, was born at Lancaster on the 24th of May 1794. He was the son of a house carpenter, whose little library supplied the first books which excited the literary ambition of his son. From the Grammar School of Lancaster he went to Hevenham, in order to be qualified for holding an Exhibition at Trinity College, Cambridge. After gaining this Exhibition of £50 a-year, he commenced residence at Cambridge, and distinguished himself so much that in his first year he gained a scholarship and a Foundation Sizarship. In the mathematical tripos of 1816 he graduated as second wrangler. In 1817 he was elected Fellow of Trinity, and soon after this he began to lecture on mathematics as assistant tutor, at the salary of £75 per annum. He was elected a Fellow of the Royal Society of London in 1820, and he enriched their Transactions from 1833 to 1840 with *twelve* papers, entitled

"Researches on the Tides." In 1837, after the publication of the ninth series, the Royal Society conferred upon him the Royal Medal, in recognition of the great value of his Researches.*

In 1821 he published his "Syllabus of an Elementary Treatise on Mechanics," and in 1823 his "Treatise on Dynamics." In 1823 he became Tutor of Trinity, an office which he held till 1839.

In 1828 he was appointed Professor of Mineralogy; and if we desired an example of the unrivalled power with which he mastered a subject with which his previous studies had but little connection, it will be found in the admirable report "On the Progress and Present State of Mineralogy," which he communicated to the British Association in 1832.† In 1833 Dr Whewell published his Bridgewater Treatise, entitled "Astronomy and General Physics, considered in reference to Natural Theology."

In 1837 he published his principal work, entitled the "History of the Inductive Sciences, from the Earliest to the Present Times." In appreciating the value of this noble record of physical truth, and admiring the capacity and vast acquirements of its author, we must at the same time regret the numerous deficiencies in the work, and its doubtful decisions in the controversies of science. As a necessary sequel to this work he published, in 1841, "The Philosophy of the Inductive Sciences," a work of able and ingenious speculation, which the public did not so gratefully receive.

In 1837 he preached before the University four sermons on the foundation of morals, and having been thus led to the study of this branch of knowledge, he accepted, in 1838, the Chair of "Moral Philosophy and Casuistry," as he called it. While he occupied this chair he composed "Lectures on the History of Moral Philosophy in England," "Lectures on Systematic Morality," and "Elements of Morality and Polity," which appeared in 1845. His attention being thus directed to the subject of international law, he published a condensed translation of Grotius' "De Jure Belli et Pacis;" and regarding this subject, as we now find it to be, of national importance, he left to the University an ample legacy to found a Chair of International Law, with scholarships for the most distinguished students.

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* See Phil. Trans. 1833, p. 147; 1834, p. 15; 1835, p. 83; 1836, pp. 1, 131, 129; 1837, pp. 79, 227; 1838, p. 231; 1839, pp. 151, 163: 1840, pp. 161, 255.

† Report in 1832, pp. 322–365.

In 1841 he married Miss Marshall, and a few months afterwards he was, on the resignation of Dr Wordsworth, made Master of Trinity. The domestic happiness which he enjoyed in this new position was marred by a long and painful illness of Mrs Whewell, and his grief on this occasion is said to have been so profound that, in order to occupy his mind in this season of affliction, he composed his work of "The Plurality of Worlds," which was published in 1853. A more probable opinion is, that the book was written to quiet certain doubts which had arisen in the mind of his wife respecting the doctrine of redemption, on the ground of the comparative insignificance of our planet, and of the race in whose behalf the Deity interposed. But whatever was the motive or state of mind under which this singular work was composed, we can hardly admit that a mind so richly endowed, and so strong in its religious conviction, could have believed in the assertions that the nebulæ are "dots and lumps of light;" that "the distant stars are sparks struck off from the potter's wheel in the formation of the universe;" that Jupiter is "a mere sphere of water with a few cinders in its centre;" that the ninety asteroids are "bits of a planet that had failed in the making;" and that the nineteen satellites of the solar system "are pieces of vapour neatly wound into balls."

But, however sternly posterity may denounce the paradox, "that our earth is the oasis in the desert of the solar system," "the really largest planetary body" it contains, and "the only world in the universe," they will forgive its author on account of the noble sentiments, the lofty aspirations, and the suggestions almost divine, which mark his closing chapter on the future of the universe. In the bright noon of his intellectual life, Dr Whewell had hazarded the sentiment, "that science was its own reward," requiring neither patronage for its extension, nor liberality to its cultivators; but when a high position rewarded his own acquirements and stimulated his own labours, he turned with sympathy to his less fortunate fellow-workmen, and looked for their reward to "a universal and perpetual peace," in which the advancement of human knowledge should be the great object of every social and national combination. "Were the nations of the earth," says he, "to employ for the promotion of human knowledge a small fraction only of the means, the wealth, the ingenuity, the energy, the combination which they have employed in every age for the destruction of human life and human means of enjoyment, we might soon find that what we hitherto knew is little compared with what man has the power of knowing." Would that these words were placed in letters of gold above the portal of every college in the empire, and pondered by every student to whom the name of statesman, and patriot, and Christian, is dear.

Though happy in his domestic relations, they were to Dr Whewell the cause of the deepest sorrow. The ill health of Mrs Whewell had for several years been a source of great anxiety and care, and in December 1855 he mourned her loss in a volume of elegiac verses, printed for private circulation. In 1858 he married Lady Affleck, the widow of Sir Archibald Affleck, and after eight years of uninterrupted happiness, he had again, in 1865, to resign himself to another domestic bereavement.

After some months of sorrow and seclusion, Dr Whewell was so far able to resume his studies, as to write the article on "Comte and Positivism," which appeared in "Macmillan's Magazine" for March 1866; and he prepared for "Frazer's Magazine" a paper "On Grote's Plato," which was destined to be the last of his works.

On the 24th February 1865, when taking a ride, he met his own carriage with ladies who were his guests, and turned to follow them home. His horse became excited and ran off, and losing all control over it, owing to a weakness in his left arm from a previous fall from horseback, he fell upon his horse's neck and then to the ground upon his head. A concussion of the brain, which had previously been in a shrunk state, terminated fatally on the 6th March 1866, in the 72d year of his age.

The great talents and acquirements of Dr Whewell were as highly appreciated in foreign countries as in his own. His Syllabus of Mechanics, and his "Mechanical Euclid," were translated into German. He was a corresponding member, in the section of Philosophy, of the Academy of Moral and Political Sciences in the Imperial Institute of France, and an honorary or corresponding member of various academies in Europe and America.

Alexander Macduff, Esq., was born at Springfield Cottage, near Perth, on the 5th December 1816, and was the son of Alexander Macduff of Bonhard. He received the rudiments of his education at the Grammar School of Perth, and also at the Perth Academy, where he obtained the first prize for general proficiency during the session 1831–2. He entered the University of Edinburgh in 1832, and, after attending the usual course of instruction, he began the study of law in 1835. He passed as writer to the Signet in 1839, and continued in the profession in partnership with Mr Welsh of Collin till 1845, when he retired to Perthshire, where he lived upon his estate from 1847 to 1860, discharging the various important duties which our landed proprietors are called upon to perform. In 1859 he acted as Secretary to the Royal Commission on Roads and Bridges in Scotland. In 1860 he took up his residence in Edinburgh, and was appointed Vice-Convener and Secretary of the Church Endowment Scheme. In 1865 he was elected Secretary to the Highland and Agricultural Society of Scotland, and he had hardly entered upon the duties of his office when he was attacked with pleurisy, and died at Edinburgh on the 21st March 1866, in the 50th year of his age.

William Bonar was born in Edinburgh on the 3d January 1798, and was the third son of Andrew Bonar of Kimmerghame and Warriston, banker in Edinburgh. After receiving his classical education at the High School of Edinburgh, he went through the usual course of study at the University.

In 1817 he was admitted a partner of the bank of Messrs Ramsay, Bonar, & Co., and he continued to discharge its duties till it was merged in the Bank of Scotland.

Mr Bonar was one of a body of excellent men in Edinburgh who employ their wealth and their leisure in promoting and managing the many religious and charitable institutions by which Edinburgh is distinguished. He was a man of fervent piety, and along with his brother, Mr Andrew Bonar, now the only survivor of four brothers, he employed a missionary to look after the ignorant and neglected poor. In the same good cause, Mr Bonar wrote several religious tracts during his residence in Edinburgh.

Having purchased Warriston from his brother, Mr James Bonar, he lived there with his family, till the interference of railways with its amenity drove him to Babbicombe, in Devonshire, where he continued those benevolent labours which he had so zealously prosecuted during his residence in Edinburgh.

Mr Bonar was elected a Fellow of this Society in 1822. He took a great interest in matters of science, but specially in the great inventions which were in his time bearing such noble fruit.

Mr Bonar died at Malvern, where he had gone for the recovery of his health, on the 9th of November 1866, at the age of 68.

James Stevenson was born at Paisley on the 28th April 1786, and was the son of Mr Stevenson, a silk-gauze manufacturer in that town. He was educated at the Grammar School there, and afterwards went to Glasgow, where he remained for thirty years in business as a merchant and cotton-spinner. In 1844 he removed to South Shields, where he became senior partner in the Jarrow Chemical Works, the importance and extent of which were greatly increased by his energy and talents for business.

At South Shields he took a deep interest in the welfare of the working classes, founding excellent schools for their children, and reducing, as far as practicable, the work usually done on the Sabbath. He established the "North and South Shields Gazette," a newspaper by which the public interests of these two large towns were greatly advanced. Mr Stevenson was likewise the most active promoter of a company for supplying South Shields with water, which previously had been chiefly derived from surface wells. He was an elder in the Free Church, and an active and liberal friend of the Presbyterian Church in England.

In 1854 he retired from active business, and spent the rest of his life in Edinburgh. He was elected a Fellow of this Society in 1865, and he died in his house, in Randolph Crescent, on the 13th June 1866, in the 81st year of his age.

William Thomas Brande, an eminent chemist, was born in 1786, and was the grandson of a physician who came from Hanover with one of the Georges. After being educated at Westminster School, he went to complete his education in Hanover, but, on account of the disturbed state of Germany, he returned to England in 1803, and entered St George's Hospital, attending the lectures and dissecting room of that institution. At this time he communicated several papers to Nicholson's Journal: one *On Benzoin* in 1805;* one on *The Theory of Respiration* in 1805;† and another *On the Enamel of the Teeth* in 1806.‡ In 1806 he communicated to the Royal Society a paper *On Guaiacum*, which was published in their Transactions. In 1808 he examined the calculi in the Hunterian Museum, and gave lectures on Chemistry in Dr Hooper's in Cork Street. At this time he became a member of the New Medical School in Windmill Street, and began his career as a Teacher and Demonstrator in Chemistry, publishing many important papers in the "Philosophical Journals," and in the "Transactions of the Royal Society." In 1809 he was elected a Fellow of the Royal Society. In 1813 he received the Copley Medal for his communications to the Society; and on the death of Dr Wollaston, in the same year, he succeeded him as Principal Secretary to that body, an office which he held till 1826. In 1812 he was elected Professor of Chemistry and Materia Medica to the Apothecaries' Company, of which he became Master in 1851. On Sir Humphry Davy's recommendation, he was elected Professor of Chemistry to the Royal Institution; and he occupied that position for many years, in conjunction with Dr Faraday. He was elected an Ordinary Fellow of this Society in 1815, but made no contributions to our Transactions. In 1816 he began, in conjunction with Dr Faraday, to publish "The Journal of Science and the Arts, edited at the Royal Institution," which was continued in sixteen volumes till 1825, when he was appointed Superintendent of the Die department in the Mint. In 1836 he was appointed Fellow, and in 1846 Examiner in the London University. In 1853 he received the honorary degree of D.C.L. from the University of Oxford. In 1823 he published his his "Manual of Pharmacy," and in 1842 his "Dictionary of Art and Science."

He took an active interest in the establishment of the University of London, and was one of its Senate. Mr Brande was particularly distinguished as an expositor of science, as is testified by the success of his "Manual of Chemistry," which has passed through six editions, and has been translated into the leading foreign languages. He was one of the eminent galaxy of chemists that has rendered the Royal Institution so illustrious. The successor of Davy and colleague of Faraday could not have failed to have had a marked influence on the progress of chemistry; and though he has not left behind him many original memoirs, he has certainly done much to diffuse a knowledge of that science, and to render its study attractive by the clearness of his exposition of its leading truths.

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* Vol. x. p. 89. † Vol. xi. p. 79. ‡ Vol. xiii. p. 214.

The following statement respecting the Members of the Society was read by the Chairman:—

I. Honorary Fellows—		
Royal Personages,	2	
British Subjects,	19	
Foreign,	35	
Total Honorary Fellows,		56
II. Non-Resident Member under Old Laws,		1
III. Ordinary Fellows—		
Ordinary Fellows at November 1865,		273
New Fellows, 1865–66—Sir James E. Alexander, Adam Black, David Chalmers, W. D. Clark, Thomas Constable, David Douglas, Dr James Dunsmure, William Euing, James Falshaw, Joseph M. Joseph, Dr A. Keiller, Alexander Macduff, John M'Culloch, John Macnair, Professor David Masson, Dr Arthur Mitchell, Dr Charles Morehead, Right Rev. Bishop Morrell, Thomas Nelson, Dr John Alexander Smith, Professor Spence, Dr Thomas Grainger Stewart, Dr Fraser Thomson, John K. Watson, Dr Patrick Heron Watson,		25
		298
Deduct Deceased—William Bonar, William Thomas Brande, John Archibald Campbell, John Cay, Dr David Craigie, Dr James Duncan, Sir John H. S. Forbes, Dr R. Kaye Greville, Hon. Lord Ivory, Alexander Macduff, Rev. Dr Macfarlane, Charles Maclaren, Alan Stevenson, James Stevenson,	14	
Resigned—Alex. Christie, William Handyside, Dr J. P. Macartney, Dr Pagan,	4	
Cancelled for Non-payment of Admission Fee—W. D. Clark, Dr Joseph,	2	
Cancelled for Non-payment of Annual Subscriptions—James Hannay, Dr M'Kinlay,	2	
Total Deductions,		22
Total Number of Ordinary Fellows at November 1866,		276

The following Donations to the Library were announced:—

Philosophical Transactions of the Royal Society of London. Vol. CLVI. Part 1. 4to.—*From the Society.*

Proceedings of the Royal Society of London. Nos. 83–87. 8vo.—*From the Society.*

Transactions of the Zoological Society of London. Vol. V. Part 5. 4to.—*From the Society.*

Proceedings of the Zoological Society of London. 1865. Parts 1 . 8vo.—*From the Society.*

Report of the Council of the Zoological Society of London. 1866. 8vo.—*From the Society.*

Quarterly Journal of the Geological Society. Vol. XXII. Parts 2–4. London, 1866. 8vo.—*From the Society.*

Journal of the Chemical Society. Nos. 41–47. London, 1866. 8vo.—*From the Society.*

Journal of the Statistical Society of London. Vol. XXIX. Parts 2 and 3. 8vo.—*From the Society.*

Journal of the Linnean Society. Botany, Vol. IX., Nos. 37, 38; Zoology, Vol. IX., Nos. 33 and 34. London, 1866. 8vo.—*From the Society.*

Proceedings of the Meteorological Society. Vol. III. Nos. 23–26. London, 1866. 8vo.—*From the Society.*

Journal of the Royal Geographical Society. Vol. XXXV. London, 1865.—*From the Society.*

Proceedings of the Royal Geographical Society. Vol. X. Nos. 3–6. London, 1866. 8vo.—*From the Society.*

Journal of the Royal Horticultural Society of London. Vol. I. Part 3. 1866. 8vo.—*From the Society.*

Proceedings of the Royal Horticultural Society of London. Vol. I. (New Series). Parts 4 and 5. 1866. 8vo.—*From the Society.*

Proceedings of the Society of Antiquaries of London. Vol. II. No. 7. 1864. 8vo.—*From the Society.*

Catalogue of a Collection of Printed Broadsides in the possession of the Society of Antiquaries of London. Compiled by Robert Lemon, Esq. London, 1866. 8vo.—*From the Society.*

Proceedings of the Royal Medical and Chirurgical Society of

London. Vol. V. Nos. 4 and 5. 1866. 8vo.—*From the Society.*

Transactions of the Royal Medical and Chirurgical Society of London. Vol. XL. 8vo.—*From the Society.*

Journal of the Royal Asiatic Society of Great Britain and Ireland. Vol. II. Part 1. New Series. London, 1866. 8vo.—*From the Society.*

Journal of the Asiatic Society of Bengal. History: Part 1, No. 4, 1865; Part 1, No. 1, 1866. Physical Science: Part 2, No. 4, 1865; Part 2, No. 1, 1866. Calcutta, 1866. 8vo. —*From the Society.*

Proceedings of the Asiatic Society of Bengal, with Index for 1865. Nos. 1–3, for 1866. Calcutta. 8vo.—*From the Society.*

Memoirs of the Literary and Philosophical Society of Manchester. Third Series. Vol. II. 8vo.—*From the Society.*

Proceedings of the Literary and Philosophical Society of Manchester. Vols. III. and IV. 1864–65. 8vo.—*From the Society.*

Journal of the Royal Geological Society of Ireland. Vol. 1. Part 2. Dublin, 1866. 8vo.—*From the Society.*

The American Journal of Science and Arts. Vol. XLI. No. 123; Vol. XLII. No. 124. New Haven, 1866. 8vo.—*From the Editors.*

The Canadian Journal of Industry, Science, and Art. New Series. No. LXII. Toronto, 1866. 8vo.—*From the Canadian Institute.*

Proceedings of the Academy of Natural Sciences of Philadelphia. Nos. 1–5. 1865. 8vo.—*From the Academy.*

Proceedings of the American Philosophical Society. Vol. X. No. 75. Philadelphia, 1866. 8vo.—*From the Society.*

Catalogue of the Library of the American Philosophical Society. Part 2. Philadelphia, 1866. 8vo.—*From the Society.*

Journal of the North-China Branch of the Royal Asiatic Society. New Series. No. 2. 1865. Shanghai. 8vo.—*From the Society.*

Illustrated Catalogue of the Museum of Comparative Zoology at Harvard College. No. 2. Cambridge, Mass. 4to.—*From the College.*

Extracts of Papers by Isaac Lea, LL.D., from the Proceedings of the Academy of Natural Sciences of Philadelphia. 8vo.—*From the Author.*

Catalogue of the Library of the Royal United Service Institution. London, 1865. 8vo.—*From the Institution.*

Astronomical and Meteorological Observations made at the Radcliffe Observatory, Oxford, in the year 1863. Vol. XXIII. Oxford, 1866. 8vo.—*From the Observatory.*

Geological Survey of Canada; Report of Progress from its commencement till 1863, with Atlas. Montreal, 1865. 8vo.—*From the Survey.*

Memoirs of the Geological Survey of India. Vol. III. Nos. 6–9; Vol. IV. Part 3. 4to. Vol. V. Part 1. 8vo.—*From the Survey.*

Annual Report of the Geological Survey of India for 1864–65. Calcutta. 8vo.—*From the Survey.*

Catalogue of the Organic Remains belonging to the Echinodermata in the Museum of the Geological Survey of India. Calcutta, 1865. 8vo.—*From the Survey.*

Journal of the Scottish Meteorological Society. Nos. 10–12. Edinburgh, 1866. Large 8vo.—*From the Society.*

Second Report upon the River Waimakariri, and the lower plains of Canterbury, New Zealand. By W. T. Doyne, C.E. Christchurch, 1865 Fol.—*From the Author.*

Documents of the United States Sanitary Commission. Vols. I. and II. New York, 1866. 8vo.—*From the Commission.*

United States Sanitary Commission Bulletin for 1863–65. New York, 1866. 8vo.—*From the Commission.*

Ages of United States Volunteer Soldiery. New York, 1866. 8vo.—*From the United States Sanitary Commission.*

Annual Report of the Board of Regents of the Smithsonian Institution. 1864. Washington, 1865. 8vo.—*From the Institution.*

Annual Report of the Trustees of the Museum of Comparative Zoology at Harvard College, Cambridge, Mass.; together with the Report of the Directors. 1864–65. Boston, 1866. 8vo.—*From the Trustees.*

Bulletin of the Museum of Comparative Zoology, Cambridge, Mass., U.S. 8vo.—*From the Trustees.*

Proceedings of the Boston Society of Natural History for 1865–66. 8vo.—*From the Society.*

Condition and Doings of the Boston Society of Natural History. 1865. 8vo.—*From the Society.*

Proceedings of the American Academy of Arts and Sciences. Vol. VII. Boston, 1866. 8vo.—*From the Academy.*

Astronomical and Meteorological Observations, made at the United States Naval Observatory during the year 1863. Washington, 1865. 4to.—*From the Observatory.*

Reports on the Extent and Nature of the Materials available for the preparation of a Medical and Surgical History of the Rebellion. Philadelphia, 1865. 4to.—*From the United States Government.*

Memoirs of the Royal Astronomical Society. Vol. XXXIV. London, 1866. 4to.—*From the Society.*

Transactions of the Royal Irish Academy. Vol. XXIV. Antiquities, Parts 5–7; Polite Literature, Part 3; Science, Part 5. Dublin, 1866. 4to.—*From the Academy.*

Astronomical, Magnetical, and Meteorological Observations, made at the Royal Observatory, Greenwich, in the year 1864. London, 1866. 4to.—*From the Observatory.*

Verification and Extension of La Caille's Arc of Meridian at the Cape of Good Hope. By Sir Thomas Maclear. Vols I. and II. 4to.—*From the Royal Observatory, Greenwich.*

Report of the Professor of Astronomy in the University of Glasgow. 1866. 8vo.—*From the University.*

Annual Report for 1864–65 of the Leeds Philosophical and Literary Society. 8vo.—*From the Society.*

Catalogue of the Library of the Leeds Philosophical and Literary Society. 8vo.—*From the Society.*

Report of the Proceedings of the Geological and Polytechnic Society of the West-Riding of Yorkshire, 1864–65. Leeds, 1866. 8vo.—*From the Society.*

Proceedings of the London Mathematical Society, Nos. 1–7. 8vo. *From the Society.*

Nugæ Mathematicæ, by J. J. Sylvester, LL.D. 1866. 8vo.—*From the Author.*

Results of a series of Experiments on the Strength of Colonial Woods. By James Melville Balfour, C.E. 1865. 8vo.—*From the Author.*

On the Affinities of Platysonus and allied Genera. By John Young, M.D. 1866. 8vo.—*From the Author.*

Science and Christian Thought. By John Duns, D.D. London, 1866. 8vo.—*From the Author.*

Quarterly Return of Births, Deaths, and Marriages registered in the Divisions, Counties, and Districts of Scotland, Nos. 45–47. Edinburgh, 1866. 8vo.—*From the Registrar-General.*

Monthly Returns of Births, Deaths, and Marriages registered in the Eight Principal Towns of Scotland. March to November, 1866. Edinburgh, 1866. 8vo.—*From the Registrar-General.*

Annual of the National Academy of Sciences for 1865. Cambridge, U.S. 8vo.—*From the Academy.*

The St Andrews University Calendar for 1866–67. Edinburgh, 1866. 8vo.—*From the University.*

Modern Theory of Chemical Types, &c. By Charles M. Wetherill, Ph.D., M.D. 8vo.—*From the Author.*

A Word on the Origin of Life. No. 4. By James D. Dana. 8vo. —*From the Author.*

Supplementary Report on the Mortality Experience of the Scottish Equitable Assurance Society. By William Robertson, M.D. Edinburgh. 8vo.—*From the Author.*

Geology and Modern Thought, an Address to the Edinburgh Geological Society. By David Page, F.R.S.E. 8vo.—*From the Society.*

Epidemic Epizootic Fever Cattle Plague. By Draper Mackinder, M.D. London, 1866. 8vo.—*From the Author.*

On Finding the most Economical Rates of Expansion in Steam Engines. By W. J. Macquorn Rankine, LL.D. 4to.—*From the Author.*

The Distribution and Migrations of North American Birds. By Spencer F. Baird. 8vo.—*From the Author.*

Areas of the Drainage of Scottish Rivers and their Principal Tributaries. MS. Plans.—*From James Leslie, C.E.*

Catalogue of the Specimens of Meteoric Stones and Irons in the Museum of the Geological Survey, Calcutta. By T. Oldham. 8vo.—*From the Author.*

On a Balanced Rudder for Screw Steamers. By W. J. Macquorn Rankine, LL.D. 4to.—*From the Author.*

Memorie della Reale Accademia della Scienze di Torina. Serie II. Tomo XXI. Torino, 1865. 4to.—*From the Academy.*

Novorum Actorum Academiæ Cæsareæ Leopoldino-Carolinæ Germanicæ Naturæ Curiosorum. Vol. XXXII. Part 1. Dresdæ, 1865. 4to.—*From the Academy.*

Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin, 1864. 4to.—*From the Academy.*

Monatsberichte der Königlichen Preuss. Akademie der Wissenschaften zu Berlin, 1865. Jan.–Juli, 1866. 8vo.—*From the Academy.*

Nieuwe Verhandelingen van het Bataafsch Genootschap der proefondervindelijke Wijsbegeerte te Rotterdam. Deel XII. Stuk 2, 3. Rotterdam, 1865. 4to.—*From the Batavian Society of Natural Philosophy.*

Memorie dell' Accademia delle Scienze dell' Istitute di Bologna. Serie II. Tomo IV. Fasc. 2–4. Tomo V. Fasc. 1, 2. Bologna, 1865–66. 4to.—*From the Academy.*

Rendiconto delle Sessioni dell' Accademia delle Scienze dell' Istituto di Bologna, 1864–65. 8vo.—*From the Academy.*

Recueil des Voyages et des Mémoires publié par la Société de Géographie. Tome VII. Part 2. Paris, 1864. 4to.—*From the Society.*

Mémoires de l'Académie Royale des Sciences, des Lettres, et des Beaux-Arts de Belgique. Tome XXXV. Bruxelles, 1865. 4to. —*From the Academy.*

Bulletin de l'Académie Royale des Sciences, des Lettres, et des Beaux-Arts de Belgique. 2nd Serie. Tome XX., XXI., XXII. Nos. 6–11. Bruxelles, 1865. *From the Academy.*

Mémoires Couronnés et autres Mémoires publiés par l'Académie Royale de Belgique. Tome XVIII. Bruxelles, 1866. 4to.—*From the Academy.*

Abhandlungen herausgegeben von der Senckenbergischen naturforschenden Gesellschaft. Band V. pt. 3, 4. Frankfort, 1865. 4to.—*From the Society.*

Amtlicher Bericht über die neun und dreissigste Versammlung Deutscher Naturforscher und Ärzte in Giessen im Sept. 1864, herausgegeben von den Geschäftsführern Wernher und Leuckart. Giessen, 1865. 4to.—*From the Authors.*

Mémoires de l'Académie Impériale des Sciences de St Pétersbourg. VII^e. Serie. Tome IX. X., N^o. 1–2. St Petersburg, 1865–66. 4to.—*From the Academy.*

Bulletin de l'Académie Impériale des Sciences de St Pétersbourg Tome IX. St Petersburg. 4to.—*From the Academy.*

Neue Denkschriften der Allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften. Nouveaux Mémoires de la Société Helvétique des Sciences Naturelles. Band XXI. Zürich, 1865. 4to.—*From the Society.*

Geschichte der Schweizerischen Naturforschenden Gesellschaft zur Erinnerung an den Stiflungstag den 6 Octob. 1815. Zurich, 1865. 4to.—*From the Society.*

Verhandlungen der Kaiserlich-Koniglichen Zoologisch-Botanischen Gesellschaft in Wien. Band. XV. Wien, 1865. 8vo.—*From the Society.*

Bulletin de la Société de Géographie. Paris. Tome IX. Avril-Nov. 1866. 8vo.—*From the Society.*

Schriften der Universität zu Kiel aus dem Jahre 1665. Band XII. Kiel, 1866. 4to.—*From the University.*

Atti dell' Imp. Reg. Istituto Veneto di Scienze, Lettere ed Arti dal Novembre 1864 all' Ottobre 1865. Tomo X. F. 11, pt. 1–4. Venezia. 8vo.—*From the Institute.*

Memorie del Reale Istituto Lombardo di Scienze e Lettere—Classe di Lettere e Scienze Morali e Politiche, Vol. X. 1 della serie III. Fasc. 2. Matematiche e Naturali, Vol. X., 1 della serie III. Fasc. 2.—4to. Rendiconti Matematiche e Naturali, Vol. II. Fasc. 3–8. Moralie Politiche, Vol. II. Fasc. 3–7. 8vo.—Milano, 1865.—*From the Institute.*

Bulletin de la Société Vaudoise des Sciences Naturelles. Vol. IX. No. 54. Lausanne, 1866. 8vo.—*From the Society.*

Annales des Mines, Paris. Tome VIII., Liv. 5–6.; Tome IX., Liv. 1–2. 8vo.—*From the Ecole des Mines, Paris.*

Sciences Mathématiques et Physiques chez les Belges au commencement du XIX^e. siécle. Par Ad. Quetelet. Bruxelles, 1866. 8vo.—*From the Author.*

Almanaque Nautico para 1867, Calculado de orden de S. M. en el Observatorio de Marina de la Ciudad de S. Fernando. Cadiz, 1865. 8vo.—*From the Observatory.*

Bulletin de la Société Polymathique au Morbihan 1866. Vannes, 1866. 8vo.—*From the Society.*

Memoria sobse el Eclipse de Sol de 18 de Julio de 1860. Par D. Francisco de Paula Marquez. Madrid, 1861. 8vo.—*From the Author.*

Astronomische Beobachtungen auf der Königlichen Universitats-Sternwart zu Königsberg. Von Dr Eduard Luther. Königsberg, 1862. Fol.—*From the Author.*

Jahrbuch der Kaiserlich-Königlichen Geologischen Reichsanstalt. Band XV. N°. 4. Band XVI. N°. 1. Wien, 8vo.—*From the Archivar of the Reichsanstalt.*

Denkschriften der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe, Band XXIV., XXV. Philosophisch-Historische Classe, Band XIV. Wien, 1865. 8vo.—*From the Academy.*

Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Phil. Hist. Classe, Band XLIX., L., LI. Heft 1–3.; B. LII. H. 1–4. Math.-Nat. Cl., Band LI. Heft 3–5.; B. LII. H. 1–5. B. LIII. H. 1–5.; B. LIV. H. 1. Register Math. Nat. Cl., Band V. Phil. Hist. Cl., Band V. Almanach, 1865. Wien, 8vo.—*From the Academy.*

Sitzungsberichte der Königl. bayer. Akademie der Wissenschaften zu München, 1865, Heft 3, 4; 1866, Heft 1–3. München, 8vo.—*From the Academy.*

Mittheilungen der Naturforschenden Gesellschaft in Bern, aus dem Jahre, 1865. Nr. 580–602. Bern, 1866. 8vo.—*From the Society.*

Übersicht der Thütigkeit der Nicolai-Hauptsternwarte wahrend der ersten 25 Jahres ihres Bestehens, zusammengestellt von Otto Struve. St Petersburg, 1865. 8vo.—*From the Author.*

Jahresbericht am 19 Mai 1865, den Comité der Nicolai-Hauptsternwarte. Von dem älteren astronomen W. Döllen. St Petersburg, 1865. 8vo.—*From the Author.*

De Sarcine (Sarcina ventriculi, Goodsir) onderzoek naar de plantaardige natuur, dem ligchaamsbrouw en de ontwikkelingswetten van dit organisme. Door Dr W. F. R. Suringar. Leeuwarden, 1865. 4to.—*From the Author.*

Jahresbericht über die Forstchritte der Chemie und Verwandter. Theile Anderer Wissenschaften von C. Bohn, Th. Engelbach, und H. Will; fur 1865. Heft 1. Giessen, 1866. 8vo.—*From the Editors.*

Libro Duodecimo della Politica del Commendatore Salvatore Fenicia da Ruvo. Napoli, 1866. 8vo.—*From the Author.*

Annuaire de l'Académie Royale des Sciences, des Lettres, et des Beaux-Arts de Belgique, 1866. Cinquantième Anniversaire de la Reconstitution de l'Académie, 1816-1866. Bruxelles, 1866. 8vo.—*From the Academy.*

Annuaire de l'Observatoire Royale de Bruxelles, par A. Quetelet. 1866. 12mo.—*From the Observatory.*

Archives Neérlandaises des Sciences Exactes et Naturelles, publiées par la Société Hollandaise des Sciences a Harlem. Tome I. Liv. 1-4. La Haye, 1866. 8vo.—*From the Society.*

Atti della R. Accademia delle Scienze di Torino. Vol. I. Disp. 1, 2. Torino, 1866. 8vo.—*From the Academy.*

Simplicii Commentarius in IV. Libros Aristotelis de Cælo, ex recensione. Sim, Karstenii, mandato Regiæ Academiæ disciplinarum. Nederlandicæ editus, 1865. 4to.—*From the Editor.*

Verslagen en Mededeelingen der Koninklijke Akademie van Wetenschappen Afdeeling Letterkunde, negende Deel-Natuurkunde, Tweede Reeks, Eerste Deel. Amsterdam, 1866. 8vo. —*From the Academy.*

Processen-verbaal van de Gewone vergaderingen der Koninklijke Akademie van Wetenschappen, Afdeeling Natuurkunde. 8vo. —*From the Academy.*

Catalogus van de Boekerij der Koninklijke Akademie van Wetenschappen gevestigd ze Amsterdam. Tweeden Deels, Eerste Stuk. Amsterdam, 1866. 8vo.—*From the Academy.*

Jaarboek van de Koninklijke Akademie van Wetenschappen, gevestigd ze Amsterdam. Voor, 1865.—*From the Academy.*

Traité des Projections des Cartes Géographiques, représentation Plane de la Sphère et du Sphéroïde, par A. Germain. Paris, 8vo.—*From the Author.*

The following Publications have been presented by the Depôt de la Marine, Paris :—

Annales Hydrographiques, 2^e, 3^e, Trimestre, Paris, 1865. 8vo.

Pilote du Golfe Saint-Laurent, 3^e Partie. Paris, 1865. 8vo.

Instructions Nautiques sur La Côte Est de la Malaisie. Paris, 1865. 8vo.

Supplément aux Instructions sur la Mer de Chine, 2^e partie. Paris, 1865. 8vo.

Supplément au Routier de l'Australie. Paris, 1865. 8vo.

Routier de l'Ile Aurigny. Paris, 1865. 8vo.

Renseignements sur quelques Mouillages de la Côte d'Islande et de Norvege. Paris, 1865. 8vo.

Recherches sur les Chronomètres et les Instruments Nautiques VIII.^{e} cahier. Paris, 1865. 8vo.

Le Pilote de la Nouvelle Zélande, 1re, 2^e partie. Paris, 1865. Fol.

Pilote de la Mer Noire. Paris, 1865. Fol.

Recherches sur les Climats de l'Epoque Actuelle, et des Epoques Anciennes particulièrement, au point de vue des Phénomènes Glaciaires de la Période Diluvienne. Par M. Sartorius de Waltershausen. 8vo.—*From the Author.*

Actes de la Société Helvétique des Sciences Naturelles, réunie a Genève. 1865. 8vo.—*From the Society.*

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